



GOVERNMENT OF THE DISTRICT OF COLUMBIA
Department of Energy and Environment

CHAPTER 2 TECHNICAL SUPPORT MEMORANDUM

TO: Stephen S. Ours, P.E. 
Chief, Permitting

FROM: John Nwoke 
Engineer

SUBJECT: **The George Washington University
Ross Hall Cogeneration Project
Permit No. 6618-R1 to Operate a Cogeneration Facility**

DATE: May 1, 2019

BACKGROUND INFORMATION

On January 8, 2019, the George Washington University (GW) submitted an air permit renewal application to operate a gas turbine and heat recovery steam generator/duct burner at Ross Hall on GW's Foggy Bottom campus. Operating Permit No. 6618-O, dated April 10, 2018, expired on April 7, 2019. The permit renewal application is a request for a renewal of Permit No. 6618-O beyond the expiry date for continued operation of the cogeneration facility.

The cogeneration facility has not changed from its existing composition. Thus, the background information, technical information and most aspects of the regulatory review in the previous technical support memo, largely remain unchanged. Much of the information below is a repeat of information in the previous technical support memo which is available in the Air Quality Division (AQD) files.

However, one significant update is appropriate to discuss in this memo. Since issuance of the previous permit, the Department of Energy and Environment (DOEE) revised 20 DCMR 805, Reasonably Available Control Technology for Major Stationary Sources of the Oxides of Nitrogen (NO_x RACT) to now apply to combustion turbines of any size, including associated heat recovery steam generators and duct burners. These new regulatory requirements must be referenced in the renewed operating permit. Details of this update are discussed in the remainder of this technical memorandum.

GW has not requested that any portions of the application be held confidential.

TECHNICAL INFORMATION

GW applied for a permit for a minor modification to its existing facility because of a planned project involving the construction of a natural gas fired gas turbine having the capacity to

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produce 4.6 megawatts (MW) of electrical power. GW installed the gas turbine and heat recovery steam generator (HRSG)/duct burner in the central utility plant within Ross Hall on its Foggy Bottom campus. The HRSG/duct burner will produce steam by burning natural gas. The HRSG/duct burner is rated at 15.2 million Btu/hour heat input (net lower heating value (LHV) basis). The HRSG/duct burner steam will be used to meet total demand, while excess steam is routed to the steam turbine at Ross Hall for generating electric power. GW applied for a renewal of the operating permit to allow continued operation of the cogeneration facility.

Emission Evaluation

GW originally analyzed the project as a minor source because the nitrogen oxide emissions from the source were projected to be 23 tons per year. This is less than the major source threshold of 25 tons per year as shown on the tables below. Note that the tables below reflect the emission rates based on the modified equipment design, and therefore differ from those reflected in the original construction permit.

Table 1: Total 12-Month Rolling Emission Limits from Permitted Equipment¹

Pollutant	12-Month Rolling Emissions Limit (tons/yr)
PM (Total) ^{2,3}	5.0
SOx	1.1
NOx	21.3
VOC	2.3
CO	21.5
HAPs (Total)	0.38

1. The equipment covered consists of one Solar Centaur 50 gas turbine, and one HRSG/duct burner.

2. Total PM is the sum of the filterable PM and condensable PM.

3. Also all PM is expected to be smaller than 2.5 microns, so PM (Total) equals PM2.5

Table 2- Maximum Hourly Emissions (lbs/hr) when Operating Between 50% and 100% Load, Inclusive

Pollutants	Solar Centaur 50 Gas Turbine (CT) and HRSG/Duct Burner (HDB)
PM (Total)	1.1
SOx	0.3
NOx	4.9
VOC	0.5
CO	4.9

It should also be noted that, while not an emission limit in the permit, total hazardous air pollutant (HAP) emissions are expected to be no more than 0.4 tons per year in total, well below the NSR significance threshold for applicability.

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REGULATORY REVIEW

20 DCMR Chapter 2, Section 200: General Permit Requirements

The provisions of this section are applicable to the cogeneration system as a stationary source of air pollution. A permit is therefore required to operate the units pursuant to 20 DCMR 200.1 and 200.2. Operation permits are valid for five years. Upon expiration, they may be renewed to allow for the continued operation of the cogeneration facility, which is what is occurring through this permitting action.

20 DCMR Chapter 2, Section 204: Permit Requirements for Sources Affecting Non-Attainment Areas

The review of the Chapter 2 permit applications indicated that the proposed equipment would emit maximum potential emissions of 21.3 tons of NO_x per 12-month rolling period as measured at the exhaust stack of the HRSG. The significance threshold to trigger NSR requirements for NO_x is 25 tons per year per the definition of “significant” in 20 DCMR 299. The proposed project will not generate emission in excess of the significance threshold, and therefore the project would not be considered a new major stationary source or a “major modification” as defined in 20 DCMR 299. Therefore, pursuant to 20 DCMR 204.1, a major non-attainment new source review analysis is not required.

Prevention of Significant Deterioration (PSD) (Federal program)

The project will have a potential to emit (PTE) of less than 250 tpy for all pollutants, except greenhouse gases, which is also below the applicable threshold, and so this project is not subject to the PSD program (implemented by EPA). The potential emissions of greenhouse gases are 35,300 metric tonnes per year on a CO_{2e} basis.

20 DCMR Chapter 2, Section 205: New Source Performance Standards

Subsection 205.1 of 20 DCMR adopts the federal New Source Performance Standards (NSPS) as in effect on September 30, 1997. Additionally, in order to be sufficiently protective of public health pursuant to 20 DCMR 201, the Department places all current NSPS standards into all Chapter 2 permits issued.

The gas turbine and HRSG/duct burner will be subject to the NSPS that applies to stationary gas turbines, HRSGs and duct burner (40 CFR Part 60, Subpart KKKK). The NSPS NO_x limit for the proposed modification is 25 ppm at 15% O₂. The NSPS also limits sulfur dioxide (SO₂) emissions to 0.060 lbs/MMBtu of heat input. 40 CFR 60 does not apply to the boilers because they are below the size thresholds for applicability of New Source Performance Standards.

20 DCMR Chapter 3: Operating Permits and Acid Rain Programs

The project is not subject to the Acid Rain Program. However, the equipment will be part of a larger facility subject to the major source operating permit program of 20 DCMR Chapter 3. As such, pursuant to 20 DCMR 301.1(a)(2), the facility must apply for the requirements of this permit to be placed into its existing Title V operating permit. This requirement is contained in Condition I(j) of the proposed permit.

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20 DCMR Chapter 5: Testing, Monitoring and Record keeping Requirements

Testing, monitoring and record keeping requirements pursuant to 20 DCMR 500.8 and 502 have been included in the permit documents under Condition III(a)(3) and (4), and Condition III(b)(3) and (4). These requirements are also based on 20 DCMR 200.7. Permit Conditions III.a.3 and III.a.3.E have been updated as appropriate to accommodate the changes requested in the September 30, 2015 GW application/letter. In summary:

1. The applicant's request to perform certain quarterly testing with supplemental duct burner firing during the fall and winter months, but without the supplemental duct burner firing during the spring and summer months was granted;
2. The applicant's request to alternate quarterly testing between the dual stack flues rather than testing in both identical flues each quarter was granted; and
3. It was clarified that both flues must be represented during all stack testing, but whenever three test runs are required, two may be performed in one flue while the third is performed in the second flue rather than splitting runs between flues or performing full tests for each flue.

20 DCMR Chapter 6: Particulates

20 DCMR 600.1 is applicable to the equipment, thus its requirements have been included. Additionally, the gas turbine and HRSG/duct burners could emit visible emissions during any period of equipment startup, operation or shutdown and as such 20 DCMR 606.1 is applicable. This requirement is also contained in the proposed permit.

20 DCMR Chapter 8: Asbestos, Sulfur, Nitrogen Oxides, and Lead

The fuel sulfur provisions of 20 DCMR 801 are not applicable because the unit will not use fuel oil.

The NO_x RACT provisions of 20 DCMR 805 (revised regulations promulgated in final form on December 14, 2018) are applicable because 20 DCMR 805.1(a)(2) specifies that the NO_x RACT applies to stationary combustion turbine of any size at major stationary source facilities, including any associated heat recovery steam generators and duct burners. 20 DCMR 805.4 has specific requirements for the applicable equipment under 20 DCMR 805.1(a)(2). The regulatory citations for the pertinent requirements have been cited in the renewed operating Permit No. 6618-R1.

20 DCMR Chapter 9, Section 903: Odorous or Other Nuisance Air Pollutants

The gas turbine and HRSG/duct burners could emit emissions during any period of equipment startup, operation or shutdown and as such 20 DCMR 903.1 is applicable. This requirement is contained in the proposed permit.

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Other Regulations

Maximum Achievable Control Technology (MACT) Standards for Gas Turbines

40 CFR 63 Subpart YYYYY for gas turbines regulates/monitors Hazardous Air Pollutants (HAPs) such as acetaldehyde, acrolein, benzene, toluene, xylene, cadmium, chromium, lead, etc, through surrogate compounds such as formaldehyde, carbon monoxide (CO) and/or volatile organic compounds (VOCs).

A facility that emits or has the potential to emit 10 tons/year of any single HAP or 25 tons/year of any combination of HAPs, is considered a major source. The proposed project will produce emissions of HAP that are under the major source threshold. The facility as a whole is also a minor source of HAPs. Therefore the gas turbine is not subject to this MACT standard.

Compliance Assurance Monitoring (CAM) (40 CFR 64)

The project is not subject to this Part because the pre-control emissions of pollutants for all sources are less than 25 tpy for VOC and 100 tpy for ammonia (NH₃) and hydrogen sulfide (H₂S), respectively.

RECOMMENDATIONS

The draft renewal permit will be published in the D.C. Register and on the Department's website on May 10, 2019 for a thirty-day public comment period.

The proposed project and attached permit comply with all applicable federal and District air pollution control laws and regulations. I recommend that the attached permit be issued promptly following the completion of the public review period if no comments are received. If comments are received, they will be addressed before any final action is taken on the permit application.

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